Evaluation of Offshore Wind Energy Development in the United States with Recommendations for the Minerals Management Service

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Introduction

Wind power is undergoing a rapid global expansion. Concerns about climate change and decreasing supplies of fossil fuels have spurred the rapid growth of wind energy in the last 20 years. However, the development of wind power as a significant source of energy has been limited by the availability of land with sufficient wind speeds to sustain commercial production. Seeking the further expansion of the wind industry, developers began to look offshore in the early 1990s. Since that time, offshore wind energy has seen a rapid expansion in Northern Europe. Denmark is the world leader in wind power and currently supplies 18% of its energy from wind powered generation.[1] The United Kingdom and Germany are also aggressively pursuing the development of offshore wind energy production to meet their carbon reduction requirements under the Kyoto Protocol of 1997 as well as to enhance domestic energy security.

Offshore wind energy has not developed as quickly in the United States. At this time, there are several proposals for offshore wind farms in the US, but none has begun construction. The first proposed wind farm in the United States, the Cape Wind Project, has been the subject of protracted, contentious debate and reveals the obstacles to the development of offshore wind energy in the US. Primary among these impediments has been the lack of an appropriate regulatory regime to govern the development of offshore wind energy. The Energy Policy Act of 2005 aims to solve this problem by granting the Secretary of the Interior and the Minerals Management Service (MMS) the authority to govern offshore wind energy development. While this Congressional decision takes advantage of the Minerals Management Service's substantial expertise dealing with Outer Continental Shelf energy extraction, it must be recognized that the development of offshore renewable energy installations is a fundamentally different endeavor. Therefore, the Minerals Management Service must be prepared to think innovatively in creating a new governance regime for the development of offshore renewable energy projects.

This comment reviews the current status of offshore wind development and makes recommendations for the extension of the Minerals Management Service's authority to govern offshore wind energy. This section will proceed by explaining the basic principles, costs, and benefits of offshore wind energy development. Subsequent sections will explore the proposals and obstacles to wind energy development in the United States, governance of offshore wind energy in Europe, and possible new approaches for the regulation of offshore energy development in the United States.

[1] Danish Energy Authority, Windturbines- Introduction to Basic Facts, http://www.ens.dk/sw14294.asp (last visited Feb. 11, 2006).

Fundamentals of Wind Energy

Wind turbines turn the power of the wind into electricity by using aerodynamic force to produce lift, causing torque on a shaft. This mechanical power is then transformed into electrical power using an electric generator.[2] Most modern wind turbines have three blades on a horizontal axis. In the past 25 years, wind turbines have become more cost-effective, reliable, and quiet.[3] Offshore wind turbine technology is advancing rapidly. Today, typical offshore turbines have a capacity of 2 MW with blades 100m long and a height of 120m.[4] Currently, several companies are designing 5MW offshore wind turbines that will have a swept area larger than a football field.[5]

The increasing size of wind turbines is one of the primary reasons to place them offshore where visual impacts can be minimized. In addition to the aesthetic justification of minimizing visual impact of wind turbines, there are several resource-related reasons for placing wind turbines offshore. The commercial exploitation of wind energy requires sustained wind speeds of 7m/s or greater. While this wind speed is typically encountered in limited terrestrial locations, it is common to have consistent, strong winds offshore. Therefore, wind energy developments placed offshore will be able to generate electricity more reliably and at a lower cost. Another advantage to placing wind turbines in the ocean is the lower surface roughness of the water creates a smoother more consistent wind regime.

Despite the benefits of offshore wind energy, development has been limited by the high cost of turbine installation. The primary factor that increases the cost of turbine installation offshore is the construction of a foundation for the wind turbine. Currently, there are three types of foundations that can be used to secure offshore wind turbines: monopile, gravity cassion, and multiple pile. A monopile is a single pole, typically about 5m in diameter, that is driven into the seabed. Monopiles cannot be used in water deeper than 25-30m because of limitations on the ability of the monopile to withstand the forces of waves and currents.[6] A gravity cassion is a hollow concrete foundation that is floated to the installation site and then filled with gravel and sand. The installation of a gravity cassion foundation requires that the seabed be prepared by divers. Gravity cassion foundations also require the installation of erosion protection around the foundation. Because of these limitations, gravity cassion foundations are too expensive to use in waters deeper than 10m.[7] A multiple pile foundation is a tripod structure similar to the foundation of an oil rig. Currently, the cost and structural integrity of foundations are the primary limitation in expanding wind energy development into deeper waters. In an attempt to overcome these limitations, moored foundations for floating wind turbines are currently in development. However, until floating turbines become readily available, offshore wind energy development is limited to shallow coastal areas with sustained wind

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[2] J.F. Manwell, J.G. McGowan & A.L. Rogers, Wind Energy Explained 14, (John Wiley & Sons Ltd 2002).
[3] *Id* at 19.
[4] *Id* at 18.
[5] Swept area is the area through which the blades of the turbine travel. American Wind Energy Association Frequently Asked Questions, *Available at* http://www.awea.org/faq/windpower.html (Last accessed 10 Feb. 2006).
[6] Nic Flemming, *Crunch Time Looms for Offshore Wind Power*, 190 New Scientist, Dec. 6 – Dec. 12 2003, 30, at 30.
[7] *Id.*

speeds of 7m/s or greater. Thus, regions with long, shallow continental shelves, such as the East Coast of the US, are the best locations to develop offshore wind energy.

The United States possesses some of the world's best offshore wind resources. In fact, it has been estimated that there may be 900GW of offshore wind energy potential in the US.[8] Much of this wind resource is located on the East Coast of the US in close proximity to major cities with high electricity demands. Thus, the expansion of offshore wind energy in the United States could be an important part of a strategy to ensure the availability of a reliable, secure energy supply.

Costs and Benefits of Offshore Wind Installation

Energy security has been an important consideration in the development of offshore wind energy in Europe. Denmark's wind energy program began in response to the oil crisis of the 1970s, and was based on the realization that economic security in the twenty-first century requires a reliable energy supply that is not susceptible to price shocks.[9] The summer of 2005 was marked by several severe hurricanes in the Gulf of Mexico. These hurricanes and the resulting fuel shortages highlighted the vulnerability of the US domestic energy supply, which is overly dependent on a single region of the country. In the aftermath of Hurricane Katrina, the oil industry and its petroleum dependent partners pushed Congress to open areas of the Outer Continental Shelf outside of the Gulf of Mexico and Alaska to oil and gas exploration.[10] The oil industry argued that new exploration in other regions was necessary to increase domestic energy security through regional diversification of energy production. While regional diversification of energy production is essential to the security of the US energy supply, many residents of coastal states are strongly opposed to oil and gas extraction in their regions. Additionally, some areas, including much of the East Coast, do not possess significant offshore oil and gas resources. Therefore, these regions are better suited to enhance their energy security by looking to the development of renewable energy sources including offshore wind energy.

In addition to increasing energy security, wind energy offers a number of important environmental benefits. Wind generated electricity produces no emissions and has little or no associated social cost.[11] Therefore, wind energy can be an important component of a global strategy to reduce carbon dioxide emissions in response to the threat of global climate change. This priority is apparent in Northern Europe, where the aggressive expansion of offshore wind energy is considered to be a critical element in meeting national obligations under the Kyoto Protocol.[12] As a zero-emissions technology, wind generated energy can also reduce levels of a number of significant

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[8] Willett Kempton, Jeremy Firestone, Jonathan Lilley, Tracy Rouleau, and Phillip Whitaker, *The Offshore Wind Power Debate: Views from Cape Cod*, 33 Coastal Management, 119, 119 (2005).

[9] Sved Auken, *Answers in the Wind: How Denmark Became a World Leader in Wind Power*, 26 Fletcher F. World F.149, 150 (2002).

[10] Letter from American Gas Association to Representative Dennis Hastert, Speaker of the House (Sept. 8, 2005) (on file with author).

[11] International Energy Agency, Renewables for Power Generation Status & Prospects, 158 (OECD 2003).

[12] All EU member states have committed to an 8% reduction in CO_2 emissions in the period 2008-2012. United Nations Framework Convention on Climate Change, *Essential Background Kyoto Protocol, Available at* http://unfccc.int/essential_background/kyoto_protocol/items/3145.php (last visited Feb. 10, 2006).

pollutants including SO_x and NO_x. These conventional air pollutants have been implicated in a number of health and environmental quality problems. Therefore, the expansion of wind energy will lead to an improvement in air quality and reduce environmentally-related health problems. These benefits could be especially important in the Northeast US, an area that is in non-attainment under the Clean Air Act's National Ambient Air Quality Standards.[13]

Wind energy has always had the potential to provide these benefits, but has been considered to be cost-prohibitive. However, recent advances in wind energy generation have made wind highly cost competitive. Table 1 shows the American Wind Energy Association's comparison of the cost of wind energy to conventional energy sources in 1996. Offshore wind turbines are expected to generate electricity for 5.4 – 5.9 cents/KWh,[14] and this cost will decrease as advances in technology produce larger, more efficient turbines and less expensive foundations. In addition to advances in wind energy technology, increasing fossil fuel prices will serve to make wind energy more cost-competitive. In fact, the American Wind Energy Association predicts that wind-generated energy, the cheapest source of renewable energy will become the cheapest source of energy in the United States in the next ten years.[15]

Table 1: Comparison of cost of different energy sources[16]

Fuel	**Levelized Cost (cents/KWh) 1996**
Coal	4.8 – 5.5
Gas	3.9 – 4.4
Hydro	5.1 – 11.3
Biomass	5.8 – 11.6
Nuclear	11.1 – 14.5
Wind (onshore and offshore)	3.3 – 6.0

As described above, the benefits of offshore wind energy development are numerous and far-reaching. However, offshore wind energy development has a number of significant costs. The economic costs of offshore wind energy development have already been addressed and are not the focus of this analysis as they are rapidly decreasing and no longer prohibitive to offshore wind energy development. The primary impacts of offshore wind energy development are local and primarily aesthetic.[17] The rancorous debate over the Cape Wind Project has demonstrated the importance of view shed concerns in the development of wind energy projects.

While aesthetic impacts may be the primary concern of many opponents of offshore wind development, there are a number of potential environmental impacts that have yet to be fully quantified. These include bottom disturbance during turbine

[13] NAAQs are federally determined standards for air quality. States not meeting the NAAQs are subject to a number of federal restrictions including strict emission standards for new factories and other stationary sources of air pollution and state inspection and monitoring programs for vehicle emissions. Robert V. Percival *et al.*, Environmental Regulation Law, Science, and Policy 496 (Erwin Chemerinsky *et al.* eds., Aspen Publishers 2003).

[14] Robert Y. Redlinger, Per Dannemand Andersen, and Poul Erik Morthorst, Wind Energy in the 21st Century: Economics, Policy, Technology and the Changing Electricity Industry 81 (2002).

[15] AWEA fact sheet at http://www.awea.org/pubs/factsheets/Cost2001.PDF (last visited Jan. 15, 2006).

[16] *Id.*

[17] Redlinger *et al.*, *supra* note 14 at 163.

installation, noise, electromagnetic fields from submerged power lines, scour around installations leading to change in coastal processes, and avian impacts.

The most commonly voiced concern over the installation of offshore wind turbines is the potential for avian impacts.[18] Early terrestrial wind farm developments, which involved large numbers of small turbines with fast-moving blades, presented significant threats to bird populations, particularly when siting decisions did not account for the migratory routes of birds. Among the most infamous of these projects were the Altamont Pass wind farm in California and Tenrife in Spain. The massive mortality of raptors at these sites has created a long-standing association of wind farms with increased avian mortality. While these are important concerns, they are not directly applicable to offshore wind farms because offshore wind farms employ larger, slower turbines and if not sited in major avian flyways present a substantially reduced risk of collision.[19]

However, it would be inaccurate to claim that offshore wind farms are free from avian impacts. Potential impacts on bird populations include collision with turbines, long term habitat loss due to disturbance and barrier effects, and short term habitat loss during construction.[20] These impacts are likely to be species specific,[21] and some researchers believe that they may be more severe at offshore wind farms.[22] Others argue that while more research is needed, the impact of offshore wind farms on bird populations is likely to be small.[23] Due to the fact that impacts are likely to be species specific, each potential wind farm site will need to be carefully evaluated. Even if collision rates are projected to be low, if a bird population is already threatened, the small increase in mortality from turbine collisions may create a risk of population collapse and thus block wind farm installation.[24] While impacts on bird populations must be carefully considered in evaluating the impacts of wind farms, there is no current evidence that collisions with turbines will present major conservation problems.[25] Furthermore, the relative impacts on bird populations of habitat loss and collision due to wind farms must be weighed

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[18] *See, e.g.,* Willett Kempton, Jeremy Firestone, Jonathan Lilley, Tracy Rouleau, and Phillip Whitaker, *The Offshore Wind Power Debate: Views from Cape Cod*, 33 Coastal Management, 119, 119 (2005). And Alliance to Protect Nantucket Sound, Cape Wind: Concerns: Environment, http://www.saveoursound.org/Cape/ConcernsEnvironment.aspx (last visited Feb. 10, 2006).

[19] Cape Wind Project, Frequently Asked Questions- Cape Wind and the Environment, http://www.capewind.org/FAQ-Category8-Cape+Wind+and+the+Environment-Parent0-myfaq-yes.htm#43 (last visited Feb. 10, 2006).

[20] Klaus-Michael Exo, Ommo Hüppop, & Stefan Garthe, *Birds and Offshore Wind Farms: a Hot Topic in Marine Ecology*, 100 Wader Study Group Bull. 50, 50-53 (2003) (Review of potential impacts of offshore wind farms on birds).

[21] RHW Langston & JD Pullan, Windfarms and Birds: An analysis of the effects of windfarms on birds and guidance on environmental assessment criteria and site selection issues 2 (Council of Europe Directorate of Cultural and Natural Heritage 2002) *available at* http://www.offshorewindenergy.org/ (follow "reports" hyperlink; then follow "search"; select "Birds" under Environmental heading).

[22] *Id.*

[23] Lars Kjeld Hansen & Hans Christen Sorensen, Environmental Impacts, Social Acceptance, and Politics: A State of the Art Review, http://www.offshorewindenergy.org/ca-owee/indexpages/downloads/Brussels01_Environment.pdf (last visited Feb. 10, 2006).

[24] Langston & Pullan, s*upra* note 21.

[25] Department of Trade and Industry, Assessment of the Effects of Offshore Wind Farms on Birds, 2001, DTI/Pub URN 01/1434, at 27.

against the impact of habitat loss due to climate change that will occur from continued dependence on carbon-based fuels.[26]

The installation of wind turbine foundations can be highly disruptive. Monopile foundations are driven directly into the seabed and this installation has the potential to negatively impact benthic communities. Additionally, wind turbines require submerged transmission lines to carry electricity back to shore. In order to avoid damage to the power lines, they must be buried six to ten feet under the sediment. Cables are commonly buried using jet trenching, a technique where a high powered jet of water is used to displace sediment and bury the line. These highly invasive installation techniques may cause significant benthic disturbances and communities may take months or years to recover.[27]

The impact of noise on local marine mammal and fish populations is an important concern with the installation of wind turbines. Noise presents the greatest problem during turbine installation. Studies at the Horns Reef wind farm in Demark indicate that noise levels during turbine installation are sufficient to damage the hearing of local seal populations and conclude that seals will tend to avoid wind farm sites during the installation phase.[28] Thus, the noise of turbine installation may cause temporary habitat loss for marine mammal species. Additionally, wind turbines generate noise when they are operating. Underwater, turbines generate noise at a few frequencies between 30 and 800Hz.[29] This noise is less than that created by ship traffic and is expected to have minimal impacts.[30] However, a study completely characterizing the noise and vibrations created by offshore wind turbines will be necessary to understand the full biological impacts of noise.[31]

As previously mentioned, offshore wind farms require submerged power lines to transmit electricity back to shore. These power lines will be buried in the sediment and will emit electromagnetic radiation as a result of the transmission of electric currents. A number of electrosenstive marine species, including sharks and rays, use change in the electromagnetic field to detect prey. Thus, there is the possibility that the electromagnetic fields emitted by submerged power lines will interfere with electrosensitive species' ability to detect prey. However, at this time, there is no conclusive research demonstrating the impact of submerged power lines on electrosensitive species.[32]

Another potential concern with the installation of offshore wind turbines is that scour around wind turbines will alter tidal regimes. This concern appears to be

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[26] Pearce argues that more birds will be impacted by climate change than by wind farm impacts. Fred Pearce, *Sea Birds Might Pay the Price for Green Electricity*, New Scientist May 7 – May 14, 2005, at 10.
[27] Hansen & Sorensen, *supra* note 23.
[28] Techwise A/S, Short-term effects of the construction of wind turbines on Harbour Porpoises at Horns Reef, http://www.hornsrev.dk/Miljoeforhold/miljoerapporter/Hornsreef%20porpoises%202002.pdf (last visited Feb. 12, 2006).
[29] Hans Lidell, Utgrunden off-shore wind farm- Measurements of underwater noise, Report 11-00329-03012700, *Available at* http://www.offshorewindenergy.org/ (follow "reports"; then follow "search"; select "Noise/vibration") (last visited Feb. 12, 2006).
[30] *Id.*
[31] Department of Trade and Industry, An Assessment of the Environmental Effects of Offshore Wind Farms, 2000, ETSU W/35/00543/REP, at iv.
[32] Countryside Council for Whales, The potential effects of electromagnetic cabling between offshore wind turbines upon Elasmobranch Fishes, 2001, WHQ/70/2000-01, at 5.

unfounded as far-field models indicate no changes in tidal flows and that coastal processes at the regional level are unlikely to be impacted.[33] Furthermore, the low density of wind turbines means that the effects on tidal currents should be minimal.[34] Most offshore installations protect against scour by installing mats, rock piles, and other devices that limit sediment movement.[35] These erosion control structures can actually add to the environmental benefits of offshore wind turbines by creating a network of artificial reefs.[36]

One of the most contested potential impacts of offshore wind farm installations is their impact on fish populations. Many fishing groups in the US have opposed the installation of offshore wind farms because they fear that loss of access to the wind farm area will result in decreased fish yields.[37] While limiting the available fishing grounds may reduce fish yields in the short run, there are reasons to believe that offshore wind farms may ultimately be beneficial to fish populations. In most offshore wind farms, the spacing of turbines will be such that commercial fishing operations, particularly trawlers, will be excluded from the wind farm area.[38] Therefore, the benthic community in this area will be relatively undisturbed following installation. This may be of particular significance in areas such as the Gulf of Maine where a site may be trawled several hundred times in one year.[39] If access to the wind farm site by recreational fishermen is also limited, the wind farm will become a de facto marine reserve. The presence of these de facto reserves is likely to increase fishing yields.[40]

Even if recreational fishermen are allowed to fish inside wind farm areas, the wind farms still have the potential to enhance fish populations both because of the exclusion of frequent disturbances by commercial fishing gear and because of the artificial reef properties of the turbine foundations and scour control structures. Artificial reefs have been shown to enhance fish yields and are believed to increase populations of commercially and recreationally important species by increasing both habitat complexity and food availability.[41]

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[33]Department of Trade and Industry, Potential Effects of Offshore Wind Developments on Coastal Processes, 2002, ETSU W/35/00596/00/REP, at 31.

[34] The Marine Institute, Assessment of Impact of Offshore Wind Energy Structures on the Marine Environment, 2000, *Available at* http://www.marine.ie/industry+services/technology/renewable+energy/assesment+of+impact+of+offshore+wind+energy+structures.pdf (last visited Feb. 12, 2006).

[35] *Id.*

[36] Artificial reefs have been shown to enhance the yields of many commercially and recreationally important fish species. *See, e.g.* James A. Bohnsack & David L. Sutherland, *Artificial Reef Research: A Review with Recommendations for Future Priorities*, 37 Bull. Mar. Sci. 11, 11-39 (1985).

[37] *See, Ten Taxpayer Citizens Group* v. *Cape Wind Associates LLC*, 373 F.3d 183 (D. Mass 2004), *rev'd*, 125 S. Ct. 1071 (2005).

[38] The Marine Institute, s*upra* note 34, at ii.

[39] *Id.*

[40] For experimental evidence of reserves enhancing fish yields *see, e.g.* Gary Russ *et al.*, *Marine Reserves Benefit Local Fisheries*, 14 Ecol. App. 597, 597-606 (2004) (discussing evidence of spillover of fish from the Apo Island marine reserve in the Philippines) and Callum Roberts *et al.*, *Effects of Marine Reserves on Adjacent Fisheries*, 294 Science, 1920, 1920-1923 (2001) (discussing evidence for spillover in St. Lucia and increase in world-record sized fish in Merritt Island Florida as evidence for spillover from reserves).

[41] *See, e.g.* James A. Bohnsack and David L. Sutherland, *Artificial Reef Research: a Review with Recommendations for Future Priorities*, 37 Bull. Mar. Sci. 11, 11-39 (1985) and Frank Stimele *et al.*,

The access concerns of fishermen raise another important issue that must be considered: according to the Public Trust Doctrine, the Outer Continental Shelf (OCS) is held by the federal government in trust for the people of the United States. Therefore, the federal government has the obligation to manage the OCS and its associated resources in the manner that best serves all of the American people. This is becoming an increasingly challenging proposition with more users competing for OCS space, and has led to numerous proposals for ocean zoning.[42] In considering the potential impacts of wind farm installation, it is necessary to evaluate all use and non-use values of the OCS including fishing, sailing, and the value of having undisturbed areas in the ocean. The following sections will explore the complexities of introducing renewable energy as a competing use of the OCS and consider ways that offshore renewable energy development can best balance the concerns of multiple user groups.

Proposals for Offshore Wind Energy Development and the Energy Policy Act of 2005

Proposed Offshore Wind Developments in the United States

The first offshore wind farm to be proposed in the United States was the Cape Wind Project. The Cape Wind Project is headed by a private company that has previous experience investing in other power producing projects. The project proposes to install 130 turbines on Horseshoe Shoal off the coast of Nantucket. The turbines will each stand 417 ft. high and have blades that are 171ft. long.[43] The project is expected to have an average power output of 170MW, which is equal to nearly 75% of the total electricity demand for Cape Cod.[44] The Cape Wind Project is located in an area that is entirely under federal jurisdiction: the closest turbine will be approximately 5 nautical miles from shore. For most residents of the Cape, Cape Wind estimates that the turbines will be barley visible as white lines on the horizon.[45] Despite this minimal view shed impact, the Cape Wind Project has been a source of great controversy among residents. The permitting of the Cape Wind Project, the first of its kind in the US, has stood at the center of a debate over how non-traditional uses of the Outer Continental Shelf should be reviewed and permitted.

The Long Island Offshore Wind Initiative is a public coalition of "environmental, civic, health, & faith-based groups" that are working with the Long Island Power Authority to bring offshore wind development to Long Island Sound.[46] The proposed

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Benthic Macrofauna Productivity Enhancement by an Artificial Reef in Delaware Bay, USA, 59 ICES J. Mar. Sci. S100, S100-S105 (2002).

[42] *See* United States Commission on Ocean Policy, An Ocean Blueprint for the 21st Century, Final Report (2004), and Pew Oceans Commission, America's Living Oceans: Charting a Course for Sea Change, (2004).

[43] U.S. Army Corps of Engineers, Cape Wind Draft Environmental Impact Statement. 1-4, *available at* http://www.nae.usace.army.mil/projects/ma/ccwf/deis.htm (last visited Jul. 25, 2005).

[44] Cape Wind Associates, Project at a Glance, http://www.capewind.org/article24.htm (last visited Jul. 1, 2005).

[45] Cape Wind Associates, Project Siting and Visual Simulations, http://www.capewind.org/article7.htm (last visited Nov. 13, 2005).

[46] Long Island Offshore Wind Initiative, About LIOWI, http://www.lioffshorewindenergy.org/aboutus.html (last visited Aug. 2, 2005).

Long Island Offshore Wind Park will have 40 turbines that are projected to generate 140MW of electricity.[47] The Long Island Offshore Wind Initiative differs from the Cape Wind Project in that it is a community-based project being developed with the support of local residents.

The Galveston Offshore Wind Project is likely to be the first offshore wind farm in the United States. The Galveston project has the advantage of lying within Texas' extended state jurisdiction, and as such is subject to a different permitting process than offshore wind projects in federal waters. The developers of the Galveston project, Galveston Offshore L.L.C., have obtained an 11,355 acre lease seven miles off of Galveston for a proposed wind farm development.[48]

Cape Wind and the Need for a Federal Structure to Regulate Offshore Wind

Prior to the Energy Policy Act of 2005, the Outer Continental Shelf Lands Act limited the Secretary of the Interior's authority over Outer Continental Shelf Activities to mineral extraction, which is commonly understood to mean oil, gas, sand, and gravel.[49] As offshore wind energy developments do not fall under this definition, the Secretary of the Interior had no authority to issue permits for offshore wind energy projects at the time that the Cape Wind Project began to seek federal permits for development.

As the Secretary of the Interior did not possess any relevant authority, Cape Wind went directly to the Army Corps of Engineers seeking permits under §10 of the Rivers and Harbors Act.[50] Cape Wind applied for two separate permits: one for a meteorological data collection tower to characterize the wind regime at the proposed site and one for the wind farm itself. After conducting an Environmental Assessment for the meteorological tower, the Army Corps issued a finding of no significant impact (FONSI) and granted Cape Wind a permit to construct the tower.[51]

The development of the Cape Wind project has been subject to significant opposition by local residents. The most vocal opposition group is the Alliance to Protect Nantucket Sound (Alliance), a group of Cape residents who are primarily concerned about the view shed and avian impacts of offshore wind development in Nantucket Sound.[52] In an effort to stall the Cape Wind Project, the Alliance to Protect Nantucket Sound sued the Army Corps challenging its authority to issue a permit to Cape Wind for the meteorological tower.

The Alliance to Protect Nantucket Sound sued the Army Corps under the National Environmental Policy Act (NEPA) and the Administrative Procedure Act (APA) arguing that the permitting of the Cape Wind meteorological tower was arbitrary and capricious.[53] The Alliance challenged the Army Corps' issuance of the Cape Wind Permit on two fronts. First, the Alliance contended that the extension of the Army Corps' §10 authority

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[47] Long Island Offshore Wind Initiative, The Long Island Offshore Wind Park: The Future is Now!, http://www.lioffshorewindenergy.org/index.php (last visited Aug, 2, 2005).
[48] State of Texas, Wind Lease WL-000002, (2005) (on file with author).
[49]Guy R. Martin & Odin A. Smith, *The World's Largest Wind Energy Facility in Nantucket Sound?* 31 B. C. Envtl. Aff. L. Rev. 285, 296 (2004).
[50] *Id* at 286.
[51] Alliance to Protect Nantucket Sound v. U.S. Army Corps of Eng'rs, 288 F. Supp. 2d 64, 69 (D. Mass 2003). Hereinafter Allicance
[52] *See*, Alliance to Protect Nantucket Sound, http://www.saveoursound.org (last visited Jan. 25, 2006).
[53] Alliance, 288 F. Supp. 2d at 67.

under the OCSLA was solely for the purposes of permitting structures directly related to minerals extraction.[54] Additionally, the Alliance alleged that even if the Army Corps does have the authority to permit offshore structures that are not directly related to offshore mineral extraction, the Corps has a responsibility to ensure that the applicant has title to the land where the proposed activity will take place.[55] In the case of the Cape Wind Project, such title had not yet been obtained because the Secretary of the Interior lacked the authority to conduct OCS leases for renewable energy activities.

In *Alliance to Protect Nantucket Sound v. United States Department of the Army,* the court ruled that the Corps did in fact have jurisdiction over non-oil and gas related structures on the OCS. The language at issue in OSCLA gives the Corps jurisdiction over:

> All artificial islands and all installations and other devices permanently or temporarily attached to the seabed, which *may be* erected thereon for the purpose of exploring for, developing, or producing resources therefrom.[56]

While many scholars have interpreted this wording to mean that the Army Corps only has jurisdiction over those structures that are erected for oil and gas related purposes, the court's ruling hinged on the phrase "may be", interpreting it to mean "including but not limited to" structures that are related to oil and gas exploration and extraction.[57] Thus the Corps claim of authority over non-oil and gas related activities on the outer continental shelf was upheld.

This ruling was upheld and the question of the Corps authority to issue a permit for activities on land to which the applicant does not have title was addressed by the First Circuit Court of Appeals in *Alliance to Protect Nantucket Sound v. United States Department of the Army*.[58] On the question of the need for a property interest, the court stated that in order for the Corps to issue a §10 permit, the regulation only requires the applicant to affirm that "it possesses or will possess the requisite property interest to undertake the activity proposed in the application."[59] Thus, the court found that the Corps' issuance of a permit was not arbitrary and capricious because the Corps is not actually required to make a determination that the necessary property rights have been obtained prior to issuing a §10 permit under the expanded authority granted by OCSLA.

While the Army Corps claim of permitting authority was affirmed by the courts, the case served to highlight the need for a comprehensive regulatory regime to govern offshore wind energy. The most pressing concern was to ensure that a method of granting title to federal lands was developed. The lands of the Outer Continental Shelf are held by the federal government in trust for all residents of the United States.[60] Therefore, the federal government has a responsibility under the Public Trust Doctrine to ensure that it is adequately compensated for the use of the public trust resources of the

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[54] Alliance, 288 F. Supp. 2d at 67.
[55] Alliance, 288 F. Supp. 2d at 78.
[56] 43 U.S.C. §1333 (a)(1) (2000), emphasis added.
[57] Alliance, 288 F. Supp. 2d at 75.
[58] Alliance to Protect Nantucket Sound Inc. v. U.S. Dep't of the Army, MA 03-2604 (2005).
[59] *Id.*
[60] 43 U.S.C. §1332(3).

OCS.[61] The need to develop a process of compensation for offshore wind energy development was also underscored by an influx of proposals by companies attempting obtain development rights while the costs of wind farm development did not include leasing expenses.[62]

Congressional Response to the Need for Regulation of OCS Renewables

Recognizing the need for a regulatory structure for offshore wind energy, Congress created the basis for offshore wind energy regulation in the Energy Policy Act of 2005.[63] The Outer Continental Shelf Lands Act (OCSLA) was amended to expand the authority of the Secretary of the Interior to include offshore renewable energy projects. The amendment to OCSLA reads:

> (1) "In General – The Secretary in consultation with the Secretary of the Department in which the Coast Guard is operating and other relevant departments and agencies of the Federal Government, may grant a lease, easement, or right-of-way on the outer Continental Shelf for activities not otherwise authorized in this Act, the Deepwater Port Act of 1974 (33 USC 1501 et seq), the Ocean Thermal energy Conservation Act of 1980 (42 USC 9101 et seq), or other applicable law if those activities—
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> "(C) Produce or support production, transportation, or transmission of energy from sources other than oil and gas."[64]

The amendments to OSCLA go on to require that the Secretary create a system under which leases will be granted on a competitive basis and that a royalty scheme be created. This new regulatory system must be in place within 270 days of the passage of the Energy Policy Act.[65]

The amendment to the Outer Continental Shelf Lands Act is significant because it resolves many of the legal conflicts that surrounded the initial permitting of the Cape Wind Project. Now that the Secretary of the Interior has authority over renewable energy activities on the OCS, offshore wind farms will be subject to some type of leasing and permitting system that will ensure that the federal government will be adequately compensated for the use of public trust resources. Additionally, the question of the Army Corps' authority to issue permits for offshore wind farms has been definitively resolved. As the extension of the Army Corps §10 permitting authority is under the OCSLA, the inclusion of offshore wind in OCSLA codifies the authority of the Army Corps to issue permits for the building of offshore wind farms.

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[61] Elizabeth A. Ransom, *Wind Power Development on the United States Outer Continental Shelf: Balancing Efficient Development and Environmental Risks in the Shadow of OCSLA* 31 B.C. Envtl. Aff. L. Rev. 465 (2004).
[62] Martin & Smith, *supra* note 49, at 287.
[63] Energy Policy Act of 2005, Pub. L. No. 109-58, (2005).
[64] H.R. Rep. No. 109-190 at 460 (2005) (Conf. Rep.).
[65] *Id.*

Moving Forward with Offshore Wind Energy in the United States

As with the other administrative responsibilities under OCSLA, the Secretary of the interior has delegated the authority to regulate offshore renewable energy projects to the Minerals Management Service.[66] The Minerals Management Service is now charged with the task of creating new regulations to govern the development of offshore wind energy projects. In addition to writing regulations for new offshore wind energy projects, MMS has also taken over responsibility for the Cape Wind Project and the Long Island Offshore Wind Initiative.[67]

Prior to the passage of the Energy Policy Act of 2005, Cape Wind had already constructed the meteorological tower and the Army Corps had issued a Draft Environmental Impact Statement for the wind farm. Currently, the Army Corps' Draft Environmental Impact Statement and all comments received in the public comment period are being transferred to MMS.[68] Although the Army Corps has already written an Environmental Impact Statement (EIS) for the Cape Wind Project, MMS will conduct further studies and write a new EIS.[69] Further evaluation by MMS will be required because MMS has a much broader scope of authority than the Army Corps, and there are many issues not considered in the Army Corps' EIS that MMS must evaluate.[70]

MMS does not anticipate making a final decision about the Cape Wind Project until 2007, and is hoping to use an adaptive management approach in the installation of the Cape Wind Project.[71] At this point, the most likely outcome is that MMS will permit the installation of a limited number of turbines in a demonstration project that can be expanded once the environmental impacts of the wind farm have been established.[72] At the same time that the Cape Wind Project is moving forward, MMS is considering a variety of possible approaches to the regulation of offshore renewable energy projects. MMS hopes to build upon its experience with offshore oil and gas administration and also consider zoning approaches examining which regions of the OCS are most appropriate for different forms of OCS energy development.[73]

Learning from State-Level Experience: Offshore Wind in Texas

While MMS is in the process of determining a regulatory structure for offshore wind energy, Texas has already issued its first lease for an offshore wind farm. Due to Texas' historical jurisdiction over territorial waters as an independent nation, Texas was granted extended state jurisdiction under the Submerged Lands Act.[74] While most states retain the rights to submerged lands and associated resources out to 3 nautical miles, Texas owns all submerged lands out to 9 nautical miles.[75] Because of this extended jurisdiction, Texas can offer offshore wind developers the opportunity to build with fewer

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[66] http://www.mms.gov/offshore/RenewableEnergy/RenewableEnergyAndAlternateUses.pdf (Last visited Jan. 17, 2006).
[67] Rodney Cluck, MMS Cape Wind Project Director, personal communication.
[68] *Id.*
[69] *Id.*
[70] *Id.*
[71] *Id.*
[72] *Id.*
[73] *Id.*
[74] 43 U.S.C. §1312.
[75] *Id.*

permitting requirements. Although a §10 permit from the Army Corps is still required,[76] wind farm developments in state waters will not be required to comply with any regulations that MMS may create for offshore wind energy development in federal waters. Additionally, developers can lease land directly from the state of Texas before the federal leasing system has been completely determined.

In October of 2005, the Texas General Land Office announced that it had issued its first offshore wind farm lease.[77] Galveston Offshore Wind L.L.C. has obtained a 11,355 acre lease seven miles off of Galveston for the development of an offshore wind farm.[78] The lease agreement has three phases: a data collection phase, a development phase, and an operation phase.

In the data collection phase, Galveston Offshore Wind will construct two 80 meter meteorological towers. For the use of state lands, Galveston Offshore Wind will pay the state $10,000 a year during the data collection phase.[79] At the conclusion of the data collection phase, Galveston Offshore Wind plans to build a $300 million wind farm with fifty turbines and an anticipated capacity of 150MW.[80] The wind farm is expected to have a thirty year production phase with a phased in royalty scheme that is designed to encourage energy production at the beginning of the production phase. Royalties on wind energy production will be as follows:[81]

Years 1 to 8: 3.5%
Years 9 to 16: 4.5%
Years 17 to 30: 5.5%.

Overall, the lease is expected to provide at least $26.5million in revenue for the state.[82]

Under Texas law, all revenues from leasing of state lands for energy purposes are deposited in the permanent school fund, which is used to support public schools in Texas.[83] Due to the fact that leasing for offshore wind energy will benefit public schools and that residents of Texas are used to seeing offshore oil rigs, the General Land Office anticipates that Texas will not have the public resistance to offshore wind that has been a problem in Cape Cod.[84]

The leasing process for the Galveston Offshore Wind project was different from the process traditionally used to lease offshore lands for mineral resource extraction. Rather than the state issuing a proposal for a lease sale, Galveston Offshore Wind approached the state requesting a lease.[85] The lease site was selected by Galveston Offshore Wind because it believes that the site has a suitable wind regime for profitable energy generation.[86] The wind farm will be placed approximately seven miles offshore in order to minimize any potential aesthetic concerns.[87] Unlike leases for mineral resource

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[76] Jim Sudyam, Press Secretary, General Land Office, personal communication.
[77] Texas lands historic offshore wind project. News Release 24 Oct 2005. Available at http://www.glo.state.tx.us/news/docs/10-24-05-Offshore.pdf (Last visited 17 Jan 2006).
[78] *Id*.
[79] State of Texas, *supra* note 48.
[80] S*upra* note 77.
[81] State of Texas, s*upra* note 48.
[82] *Supra* note 77.
[83] *Supra* note 77.
[84] *Supra* note 77.
[85] Robert Blumberg, General Land Office Wind Manager, Personal Communication.
[86] *Id.*
[87] *Id.*

extraction, which are determined on the basis of competitive bidding, the terms of the least of the Galveston Offshore Wind project were negotiated by the developers and the state.[88]

Currently, the General Land Office is negotiating with a second developer for its second wind farm lease in state waters.[89] At this time, Texas plans to continue to use a case specific approach to the negotiation of offshore wind leasing rather than a competitive bidding system.[90] The primary reason for this approach is that many energy companies are unwilling to assume the financial risk of installing a wind farm before it has been proven that offshore wind turbines will be able to withstand class 4 and 5 hurricanes in the Gulf of Mexico.[91] Ultimately, Texas would like to move to a competitive leasing system for granting offshore wind leases, but feels that the one on one approach is necessary to facilitate interest in the development of offshore wind in Texas at this time.[92] In order to stimulate additional interest in offshore wind energy development, the state also hopes to place a series of meteorological towers along the coast to more fully characterize the offshore wind regime so that future developers can be more certain of their investment in offshore wind in Texas.[93]

The offshore wind leasing system in Texas is well equipped to handle the promotion and development of offshore wind energy within state waters. The state has created a system that will ensure the government is adequately compensated for the use of public trust resources while also facilitating the early phases of offshore wind energy development. While this system is likely to be highly effective in meeting Texas' renewable energy goals, it is only suitable in a situation where there is limited interest in offshore wind energy development.

Given the large number of proposals for offshore wind energy development that were submitted to the Army Corps before the Secretary of the Interior was granted jurisdiction over offshore renewable energy projects,[94] this approach will not be suitable for the initial phases of offshore wind leasing in federal waters. However, MMS can still learn from the experience with offshore wind leasing in Texas. MMS will have to determine a lease structure for the Cape Wind and Long Island Offshore Wind Initiative projects, and may be able to use a lease structure similar to those used by Texas. Additionally, MMS will be able to evaluate Texas' experience with offshore wind energy development and any potential environmental impacts of this development. This data may prove invaluable to MMS in evaluating the impact of and determining a permitting process for offshore wind energy development.

The Need to Revisit Federalism on the Outer Continental Shelf

This section has focused on the role of the states and the federal government as lessors of their own land. However, it must be noted that the success of federal offshore wind leasing will be dependent on the cooperation of the adjacent coastal states. Due to the nature of offshore wind energy development, states will have significant authority in

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[88] *Id.*
[89] *Id.*
[90] *Id.*
[91] *Id.*
[92] *Id.*
[93] *Id.*
[94] *See,* Martin & Smith, *supra* note 49 at 287, and Elizabeth A. Ransom, *supra* note 61 at 466.

the permitting of offshore wind energy. When the federal government pursues the development of offshore mineral resources, the state's only authority is the right to comment on the consistency of exploration and development plans with the state's Coastal Zone Management Plan.[95] Offshore wind developments require submerged power lines in state waters and onshore support structures including power transformation stations. Thus, states have a permitting role in the approval process for offshore wind farms.

If the adjacent coastal state were to refuse to permit submerged power lines for an offshore wind energy development, the project would likely be halted due the potentially prohibitive costs of extending power lines into a different coastal state. The situation with offshore wind energy is unique in energy development because significant federal and state approvals are required for project development. As such, the cooperation of the states will be essential to any federal plan to expand offshore wind energy generation. The successful development of offshore wind energy will require a new system of development planning that accounts for the renewable energy plans of both the state and federal governments.

Summary

The conflict over the permitting of the Cape Wind Project highlighted the need for a comprehensive federal system to govern OCS leasing for offshore wind energy development. Congress acted to fill this regulatory void in the Energy Policy Act of 2005 by expanding the authority of the Secretary of the Interior under OCSLA to include offshore renewable energy developments. While MMS prepares federal regulations and determines how to proceed with projects that are already underway, Texas has begun to pursue offshore wind leasing in state waters. Although the leasing system employed in Texas is unlikely to be effective at the federal level, MMS would be wise to evaluate the process and outcomes in Texas. Finally, offshore wind energy installations will require state permits for submerged power lines and landing stations, greatly increasing state authority over offshore energy development. For offshore renewable energy development to be successful in federal waters, the renewable energy plans of the federal and state governments must be coordinated.

Offshore Wind Energy Activities in Europe

Although the development of offshore wind energy has been slow in the United States, many Northern European countries have aggressively pursued offshore wind energy development as part of a package of solutions to enhance energy security and reduce greenhouse gas emissions. While the passage of the Energy Policy Act was an important step in creating a regulatory regime for offshore wind energy in the United States, it is still unclear what this regime will look like. In determining a best course for offshore wind energy regulation in the US, it is helpful to examine the approaches taken by other countries. This section will present the legal regimes for offshore wind energy development for the United Kingdom, Denmark, and Germany. The regulatory structures in these three countries will then be evaluated as potential models for the governance of offshore wind energy development in the United States.

[95] 16 U.S.C. §1456 (c).

United Kingdom

Currently, the United Kingdom has three large scale offshore windfarms installed with a total capacity of 213.8MW.[96] In the United Kingdom, all submerged lands in the territorial sea are property of the Crown Estate, and all submerged lands beyond the territorial sea belong to the federal government.[97] In the UK, all offshore wind developments are jointly permitted by the Crown Estate and the Department of Trade and Interior (DTI).[98] For wind farm projects within the territorial sea, the developer must obtain a lease from the Crown Estate.[99] The Energy Act of 2004 designated the area from 12 to 200 nautical miles as the Renewable Energy Zone,[100] and all developments in this zone require a license from the Crown Estate.[101]

There have been two rounds of offshore leasing conducted in the UK. The first round of offshore wind leasing was held in April of 2001, and 18 agreements were made between the Crown Estate and offshore energy developers.[102] All companies who entered into agreements with the Crown Estate were given three years to obtain the necessary consents for the proposed wind farm project.[103] A second round of leasing was conducted in December of 2003, and 15 agreements were made with seven year development options.[104]

In order to participate in the leasing process in the UK, companies were invited to pre-qualify. To pre-qualify, a company must show that it possesses financial standing, offshore development expertise, and wind farm expertise.[105] Once a company has been pre-qualified, it is invited to submit proposals for offshore wind development to the Crown Estate for consideration. For the first round of leasing agreements, all project proposals were subject to the following constraints: all sites had to be within 12 nautical miles of shore, proposed sites had to be at least 10km apart, and have a minimum generating capacity of 20MW and a maximum capacity of 30 turbines.[106] Furthermore, the UK has identified three priority areas for offshore wind development: the Thames Estuary, Greater Walsh, and North West.[107] For each of these areas, the DTI conducted a strategic environmental impact assessment (SEA) of the effects of wind energy development.[108] At this time, all proposals for offshore wind energy development must

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[96] British Wind Energy Association, Offshore Wind Introduction, http://www.bwea.com/offshore/info.html (last visited Feb. 27, 2006).
[97] Department of Trade and Industry, Policy: Offshore Renewables, http://www.dti.gov.uk/renewables/renew_2.1.3.htm (last visited Dec. 26, 2005).
[98] Department of Trade and Industry, Guidance Notes: Offshore Wind Farm Consents Process 6 (2004), *available at* http://www.dti.gov.uk/energy/leg_and_reg/consents/guidance.pdf (last visited Dec. 26, 2005).
[99] *Id* at 9.
[100] Energy Act, 2004, c. 20 §94 (Eng.).
[101] Department of Trade and Industry, *supra* note 98, at 3.
[102] Department of Trade and Industry, *supra* note 97.
[103] Department of Trade and Industry, *supra* note 97.
[104] Department of Trade and Industry, *supra* note 97.
[105] Department of Trade and Industry, *supra* note 97.
[106] Department of Trade and Industry, *supra* note 97
[107] Department of Trade and Industry, *supra* note 97.
[108] Department of Trade and Industry, *supra* note 97.

fall within one of these priority areas.[109] The important legislative provisions governing offshore wind energy development in the United Kingdom are reviewed below.

The Electricity Act 1989 §36 addresses offshore wind power stations in territorial waters.[110] The Energy Act 2004 extends the requirements of the Electricity Act 1989 to the Renewable Energy Zone (REZ).[111] Under the Electricity Act 1989, the Secretary of State for Trade and Industry (Secretary), must consent to the construction, extension, or operation of any electricity generating facility with more than 50MW capacity.[112] In 2001, the powers of the Secretary under the Electricity Act were extended to include all wind and water driven energy developments larger than 1MW.[113] When the Secretary gives consent for the construction of an offshore wind farm, he also has the ability to extinguish navigation rights through the development area.[114]

If an offshore wind developer does not want to go through the permitting process of the Electricity Act, the developer may instead seek the consent of the Secretary of Trade and Industry under the Transport Works Act.[115] The Transport Works Act 1992 gives the Secretary the right to temporarily extinguish navigation rights to accommodate wind farm development.[116] The Transport Works Act also allows the Secretary to authorize onshore components of the project and gives the Secretary the authority for compulsory land acquisition for the building of these structures.[117] As the permits issued under the Transport Works Act cover the onshore portions of offshore wind energy development, developers seeking permits under the Transport Works Act are also freed from the obligation to obtain permits under the Coastal Protection Act 1949.[118]

Developers who seek permits from the DTI under the Electricity Act 1989 must obtain permits under the Coastal Protection Act 1949 for all near shore components of the development project.[119] Under the Coastal Protection Act, a developer must obtain consent for any construction under or over the seashore below mean high water springs (MHWS).[120] Coastal Protection Act permits are not required for projects permitted under the Transport Works Act or for projects in the Renewable Energy Zone.[121] Installations below MHWS also require a license from the Secretary of State for Environment, Food, and Rural Affairs under the Food and Environment Protection Act 1985.[122]

The United Kingdom has taken a proactive stance towards monitoring the environmental impacts of offshore wind energy developments. The DTI has identified three priority areas for offshore wind development and conducted a strategic environmental assessment for each of these areas. Offshore wind farm developers are also required to create environmental statements concerning both the positive and

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[109] Department of Trade and Industry, *supra* note 97.
[110] Electricity Act, 1989, c. 29 §36 (Eng.).
[111] Energy Act, 2004, c. 20 §89 (Eng.).
[112] Electricity Act, 1989, c. 29 §36 (Eng.).
[113] Department of Trade and Industry, *supra* note 98.
[114] Electricity Act, 1989, c. 29 §36a (Eng.).
[115] Department of Trade and Industry, *supra* note 98.
[116] Department of Trade and Industry, *supra* note 98.
[117] Department of Trade and Industry, *supra* note 98.
[118] Department of Trade and Industry, *supra* note 98.
[119] Department of Trade and Industry, *supra* note 98.
[120] Department of Trade and Industry, *supra* note 98.
[121] Department of Trade and Industry, *supra* note 98.
[122] Department of Trade and Industry, *supra* note 98.

negative impacts of their proposed development, and these statements must be submitted with all permit applications.[123] As an additional measure to examine the potential environmental impacts of offshore wind farm development, the DTI and Crown Estate created Collaborative Offshore Windfarm Research into the Environment (COWRIE). COWRIE is an independent company created to raise awareness and understanding of potential impacts of offshore wind developments in the UK.[124] COWRIE was set up by the Crown Estate in the first round of offshore wind leasing using a trust fund to which all developers were required to contribute.[125] COWRIE is governed by the Crown Estate, DTI and the British Wind Energy Association and uses its resources to fund studies of the environmental impacts of wind development.[126]

Denmark

Denmark is a global leader in wind energy development. Currently 18% of Denmark's energy is supplied by wind power and this figure is expected to grow to 50% by 2030.[127] Denmark has a strong focus on both terrestrial and offshore wind power development, and government policy played a large role in driving the development of wind energy by ensuring a market for energy produced by wind power[128] and aiding in the technical development of wind turbine technology.[129] More than 80% of Denmark's wind turbines are owned by wind energy cooperatives or individual farmers.[130] Thus, public acceptance of wind energy projects has been fostered through collective ownership of energy generating turbines.

Government policy in Denmark has been a key driver of offshore wind development. Energy 21 is the government's long term action plan for the development of wind energy. Energy 21 sets long term goals and policies to send clear signals to potential investors about the future of the wind industry in Denmark.[131] Given the long time horizons involved in wind farm planning and development, such long term signals are essential to ensure the future growth of Denmark's wind industry. An important part of this long term plan has been the setting of aggressive targets for how much of the country's energy supply will be provided by wind.[132] To date, this program has been highly successful in fostering wind energy development. In fact, the official target of supplying 15% of Denmark's energy from wind power by 2005 was met three years ahead of schedule in 2002.[133]

Demark adopted a phased-in approach to the development of offshore wind that employed a series of demonstration projects to examine the viability and potential impacts of industrial scale wind farm development. The first demonstration project was a

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[123] Department of Trade and Industry, *supra* note 98.
[124] Collaborative Offshore Windfarm Research into the Environment, What is COWRIE?, http://www.offshorewindfarms.co.uk/ (last visited Feb. 27, 2006).
[125] *Id.*
[126] Collaborative Offshore Windfarm Research into the Environment, *supra* note 124.
[127] Auken, *supra* note 9, at 151.
[128] This was significant in the early stages of wind power development before wind energy was cost-competitive with fossil fuel sources.
[129] Auken, *supra* note 9, at 149.
[130] Auken, *supra* note 9, at 150.
[131] Auken, *supra* note 9, at 151.
[132] Auken, *supra* note 9, at 151.
[133] Auken, *supra* note 9, at 151.

5MW project in Vindeby begun in 1991.[134] This was followed by a second 5MW demonstration project at Tunø Knob begun in 1995.[135] Denmark's first large wind farm was permitted in 1999, and has 20 turbines and a capacity of 40MW.[136] Denmark is unique in that it has a separate approval process by which individual turbines are permitted for use. This permitting is conducted through the Risø National Laboratory and is intended to weed out low quality and potential dangerous products.[137]

In addition to the permitting of individual turbines for safety, there is a structure for permitting offshore wind farms as a whole. The Electricity Supply Act reserves the right to extract energy from wind and water in Danish territorial waters and the Exclusive Economic Zone for the Danish State.[138] The responsibility for permitting energy extraction activities in Danish waters is given to the Minister of Transport and Energy.[139] The Electricity Supply Act requires that the Minster either issue a public call for applications for offshore wind development or give competing developers a chance to submit proposals once an initial development proposal is submitted to the Ministry.[140] The Minister is also given discretion to set the criteria by which competing proposals for offshore wind energy development will be evaluated.[141]

The government's offshore wind energy policy is implemented by the Danish Energy Authority (DEA). The DEA invites applicants to pre-qualify based on financial, legal, and technical criteria.[142] Prior to inviting applications the, DEA screens regions for their potential for offshore wind energy development.[143] Screening is conducted to provide information about potential areas before a call for proposals is issued and to give the public an early opportunity to comment on wind farm development in a particular region.[144] Once a company has been pre-qualified, it may submit an application to develop a wind farm to the DEA. The DEA selects which wind farms to permit based on criteria determined by the Minister of Transport and Energy.[145]

In Denmark, calls for wind farm proposals are driven by the desire to install a specific amount of wind energy generation rather than through a regional leasing approach. However, wind farm proposals are more likely to be approved if they are in a pre-screened area that has been determined to be a priority area for development. The DEA and the Forest and Nature Agency formed a working group to recommend priority areas for wind farm development. This working group recommended four priority

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[134] Danish Energy Authority, Wind Energy Pilot Projects, http://www.ens.dk/sw15562.asp (last visited Feb. 27, 2006).
[135] *Id*.
[136] Danish Energy Authority, *supra* note 134.
[137] Auken, *supra* note 9, at 153.
[138] Act on Electricity Supply, 2004, §13 (Den.).
[139]Act on Electricity Supply, 2004, §13 (Den.).
[140] Act on Electricity Supply, 2004, §14 (Den.).
[141] Act on Electricity Supply, 2004, §15 (Den.).
[142] Danish Energy Authority, Offshore Wind Power- Danish Experiences and Solutions 1-36, 9 (2005), *available at* http://www.ens.dk/graphics/Publikationer/Havvindmoeller/uk_vindmoeller_okt05/index.htm (last visited Feb. 27, 2006).
[143] *Id* at 10.
[144] *Id* at 10.
[145] Act on Electricity Supply, 2004, §15 (Den.).

development areas for the first 4000MW of installed offshore wind capacity through 2030.[146]

Germany

Germany currently obtains about 15% of its energy from terrestrial wind power operations.[147] The future expansion of terrestrial wind power installations in Germany will be extremely limited because there is widespread public opposition to further onshore or near shore development arising from concerns over aesthetics and landscape impacts.[148] Because of these limitations, the future of wind energy development in Germany lies offshore. Currently, only pilot projects with a maximum of 80 turbines have been approved for offshore installation.[149] However, given Germany's energy demands and Kyoto obligations, offshore wind power will expand greatly in the next decade.

In Germany, the territorial sea out to 12 nautical miles is controlled by the adjacent coastal state, and the federal government controls all lands between 12 and 200 nautical miles.[150] Offshore wind farm projects in federal waters are overseen by the German Federal Maritime Agency (Bundesamt fur Seeschiffahrt und Hydrographie, BSH). The BSH grants site specific proposals for offshore wind projects in both the North and Baltic Seas.[151] Most offshore wind farms in Germany will be in federal waters and subject to the jurisdiction of the BSH.[152] Any proposals for wind farms in the territorial sea will be subject to the permitting requirements of the adjacent coastal state.[153]

For offshore wind development in federal waters, the BSH will conduct the environmental review for all proposed developments, and an EIS will be required for any proposal involving more than 25 turbines.[154] Once a wind farm has been approved by the BSH, the approval will last for 25 years and construction must begin within 2.5 years of approval.[155] New permits will be required for the continued operation of the wind farm beyond 25 years after permitting.[156] When applications for wind farm development are submitted to the BSH, they are checked for completeness and comments are sought from relevant agencies.[157] This is followed by a second round of commenting that involves a

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[146] Danish Energy Authority, *supra* note 142, at 9.
[147] Bela Hieronymus Buck, Gesche Krause, and Harald Rosenthal, *Extensive Open Ocean Aquaculture Development within Wind Farms in Germany: the Prospect of Offshore Co-Management and Legal Constraints*, 47 Ocean & Coastal Mgmt. 95, 100 (2004).
[148] *Id.*
[149] *Id.*
[150] *Id* at 105.
[151] Bundesamt für Seeschifffahrt und Hydrographie (BSH), Wind Farms, http://www.bsh.de/en/Marine%20uses/Industry/Wind%20farms/index.jsp (last visited Jan. 5, 2006).
[152] *Id.*
[153] BSH, *supra* note 151.
[154] BSH, *supra* note 151.
[155] BSH, *supra* note 151.
[156] BSH, Approval Procedure, http://www.bsh.de/en/Marine%20uses/Industry/Wind%20farms/Approval%20Procedure.jsp (last visited Jan. 5, 2006).
[157] *Id.*

larger group of stakeholders including the general public.[158] The developer is required to hold an application conference where the proposed project is presented and conflicting interests are discussed.[159] The applicant is also required to conduct an environmental impact assessment for the proposed wind farm.[160] In addition to receiving permits from the BSH, the applicant is required to obtain permits from the adjacent coastal state for the laying of submerged power cables in state waters.[161] The applicant is also required to prepare a full environmental impact assessment for the proposed project.[162]

At this point, Germany lacks a competitive system for evaluating wind energy development proposals. If multiple applications for development of wind energy at a site are received, the first application that meets all of the criteria for approval must be fully evaluated and a final decision must be made before other proposals may be considered.[163] The lack of a competitive bidding structure for wind energy installations will undoubtedly be an impediment to future offshore renewable energy developments in Germany. Additionally, the permits issued for pilot wind energy projects in Germany do not contain provisions for multiple uses of the wind farm space.[164] Consequently, wind farm developers are beginning to encounter some resistance from traditional users of ocean space who fear that they will be marginalized by further wind energy developments.[165] At this time, Germany has yet to effectively address how to convey property rights and fulfill its public trust obligations when pursuing offshore wind energy development. However, a recent amendment to the Federal Nature Conservation Act of 2002 calls for the designation of priority areas for wind development and sets out the beginnings of a legal framework to regulate offshore wind energy development.[166]

Lessons to be Learned from European Approaches

Due to their carbon reduction requirements under the Kyoto protocol, the European nations examined have taken a far more aggressive approach to the development of offshore wind energy than that of the United States. While Europe has moved forward with offshore wind energy development, this development has taken the form of smaller demonstration projects and is coupled with extensive environmental data collection and monitoring. This data will prove invaluable to the US as the environmental impact statements for the first offshore wind farms in the United States are developed. Europe's environmental monitoring program should serve as a model for the US when designing reporting requirements for offshore wind farm operators. A particularly excellent model is that of COWRIE in the UK, which funds independent scientific research that is a rich source of information on the impacts of offshore wind

[158] BSH, *supra* note 156.
[159] BSH, *supra* note 156.
[160] BSH, *supra* note 156.
[161] BSH, *supra* note 156.
[162] BSH, *supra* note 156.
[163] BSH, *supra* note 156.
[164] Buck *et al.*, *supra* note 147, at 119.
[165] Buck *et al.*, *supra* note 147, at 111.
[166] Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety (Germany), Strategy of the German Government on the use of Off-Shore Wind Energy in the Context of its National Sustainability Strategy 8 (2002), *available at* http://www.bmu.de/english/documents/doc/3389.php (last visited Jan. 6, 2006).

farm development. Given the long-term nature of offshore wind farm operation, the US would be wise to adopt a similar system that promotes ongoing research into the impacts of offshore renewable energy development.

All countries examined above began offshore wind development with a series of small pilot projects. This approach offers the benefit of allowing a developer to gain experience with wind energy before installing a full-scale commercial development and also allows for the assessment of any potential impacts of wind farms in the particular region where development will occur. The offshore wind energy projects that have been proposed in the United States are all large scale power development projects. If these projects are to be approved, the US will bypass the pilot project phase of offshore wind energy development and the learning opportunities that come with such phased-in development.

The UK and Germany have both created priority areas for offshore wind energy in order to expedite development. As part of the process of designating priority areas in the UK, a Strategic Environmental Assessment was conducted for each potential development area. The SEA considered the cumulative impact of multiple wind farms in each priority area. This process is important in saving time and money in considering cumulative impacts at a later stage as well as giving developers clear signals for the future of offshore wind. Furthermore, a system of priority areas ensures rational, comprehensive development of OCS energy resources that has been considered well in advance of specific project proposals. Given the uneven distribution of wind resources, the designation of priority areas coupled with strategic environmental assessments will be important in facilitating offshore wind development while ensuring that any environmental impacts of development are fully evaluated. In creating a leasing system for offshore renewable energy development, MMS should study the system of priority area designation and evaluation used in the UK and employ a similar model in the US.

It is interesting to note differing approaches to the rights of adjacent coastal areas in European offshore wind energy permitting processes. Germany's system is most similar to that of the US, as permits for submerged cables must be obtained from the coastal state and the coastal state retains all development rights within the German territorial sea. The UK employs a radically different approach allowing the Secretary of State for Transport and Industry to appropriate all lands necessary for the on-shore supporting structures for offshore wind development. Clearly, this option is not available to the US where coastal states retain strong rights to their territorial waters and coastal lands. As such, the MMS must work to create a collaborative development system with coastal states to ensure that the appropriate support structures for offshore wind energy development will be made available both in state waters and on state lands.

The Secretary of State for Trade and Interior may also extinguish access rights to land occupied by a wind farm. Given the strong tradition of open access rights to the sea in the US and the strong public resistance to Cape Wind, it is not wise for the US to follow suit and extinguish access rights inside of wind farms. In fact, allowing access to fishing areas inside of wind farms may be critical to their eventual public acceptance.

Thus far, wind farms in Europe have been embraced by the public, and the US can learn from Europe's experience in generating public support for offshore renewable energy development. One of the key features in the UK and German systems is the early involvement of the public through consultation. In the UK, public consultation begins

when priority development areas are initially designated. This opportunity for early public input allows the government to avoid proposing developments in areas where public opposition is high or modify proposed development areas to address public concerns. Germany has turned to the exploration of developments beyond the territorial sea in response to the public's growing concern about the aesthetic impact of more coastal and near-shore wind development. In Denmark, acceptance for wind energy development has also been fostered through the creation of wind energy cooperatives, resulting in a high degree of public ownership of Denmark's wind energy generating capacity. While public ownership of costlier offshore wind farm developments may not be feasible, the US must learn from examples in Europe and strive to garner public support for offshore wind energy development. Allowing early public commenting and using smaller pilot projects should aid in fostering public support by increasing familiarity with wind farms and allowing environmental concerns to be addressed.

Potential Approaches to Oversight of Offshore Wind Energy and Specific Recommendations

The Energy Policy Act grants authority for offshore renewable energy development to the Secretary of the Interior. This authority has been further delegated to the Minerals Management Service. MMS is in the process of developing a new part of its agency to handle offshore renewable energy development. As previously discussed, this part of MMS will handle both the continued permitting of the Cape Wind Project and Long Island Offshore Wind Initiative as well as the creation of new regulations to govern all offshore renewable energy development.

While the placement of authority for offshore renewable energy development is securely within MMS, an evaluation of the development of a regulatory regime for offshore renewable energy would be incomplete without a consideration of alternative systems of ocean governance. Consequently, this section presents a theoretical program under MMS and two other proposals for ocean energy governance and evaluates the merits of each of these approaches. The three approaches to be evaluated are the creation of a regulatory structure for offshore renewable energy within MMS; the creation of a new comprehensive energy planning authority, the Energy Resource Management Service (ERMS); and the creation of a new agency to manage all competing uses of the Outer Continental Shelf, the Outer Continental Shelf Resource Authority (OCSRA). The criteria used to evaluate these alternatives are ability to preserve expertise in OCS management, ability to consider all types of OCS energy development, ability to weigh competing uses of the OCS, cost, and political feasibility.

This section will conclude with a series of substantive recommendations for the Minerals Management Service as it proceeds with the creation of a regulatory system for offshore renewable energy. These recommendations include improved coordination with the states, measures to improve public acceptance, zoning and establishment of priority areas for offshore wind development, and development of a system of research support similar to the COWRIE program in the UK.

Theoretical Management Under the Minerals Management Service

Although the management structure for OCS renewable energy has yet to be created, it is not unreasonable to assume that it will have strong similarities to the administrative structure used to manage federal oil and gas leasing. As such, one would expect that the MMS proposal for the management of OCS renewable energy will include competitive leasing of specific areas of the Outer Continental Shelf as designated through some type of long-term development plan.

However, there are certain elements of the oil and gas leasing program that will not translate cleanly to renewable energy development. MMS concedes that the spatial scale of management for OCS oil and gas development will not be appropriate for offshore renewable energy.[167] Furthermore, MMS plans to examine different regions of the country for specific types of renewable energy development, and acknowledges that this will likely require analysis on a variety of different spatial scales.[168] MMS is well aware of the challenges it faces in creating a new regulatory regime for offshore wind energy and is working to evaluate a range of different options for offshore renewable energy management.

One of the best aspects of expanding the authority of MMS to govern offshore renewable energy development is that it ensures that the new program for renewable energy development will build upon MMS's pre-existing expertise in Outer Continental Shelf Resource Management. This option also has the advantage of being relatively inexpensive, as it will only require the hiring of new personnel to expand on pre-existing operations.

The ability of an expanded MMS to holistically consider meeting energy demand with a variety of sources will largely depend on how the management of offshore renewable energy is incorporated into MMS's system. If offshore renewable energy leasing and permitting is designed to be an entirely separate system within the same agency, then the opportunity to think comprehensively about how to meet America's energy needs is likely to be overlooked. However, if offshore renewable energy is incorporated into five-year leasing plans that the Secretary of the Interior is required to create under OCSLA,[169] there is a strong opportunity for MMS to become more comprehensive in its approach to OCS energy development. By creating long-term leasing plans that incorporate both renewable and mineral resources, MMS would be able to evaluate which portions of the Outer Continental Shelf are most appropriate for different energy uses. While this approach would help to meet the goal of attaining energy independence, the very different time lines of oil and renewable energy development and operation make it unlikely that such a system will be created. Unlike oil and gas leases, which are typically held for five to ten years, offshore renewable energy developments will have much longer life spans. In fact, offshore wind farms are expected to have a working lifetime of at least twenty years.[170] Thus, the resulting regulatory structure must be prepared to deal with these substantially longer timelines.

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[167] Rodney Cluck, MMS Director of the Cape Wind Project, personal communication Dec. 2, 2005.
[168] *Id.*
[169] 43 U.S.C. §1344 (2000).
[170] Cape Wind Project, Frequently Asked Questions: Cape Wind Timetable, http://www.capewind.org/FAQ-Category12-Cape+Wind+Timetable-Parent0-myfaq-yes.htm (last visited Feb. 28, 2006).

Expanding the authority of MMS under OCSLA also has the drawback that it does not promote comprehensive ocean planning. As MMS only has authority over offshore mineral extraction and renewable energy operations, it is not well positioned to consider other, competing uses of the OCS. This limitation to comprehensive planning is a serious impediment in the development of ocean governance for offshore wind energy because it does not allow for the full consideration of other potentially displaced uses of the OCS. The potential for displacement is likely to be more serious with offshore renewable energy installations due to the longer timelines of these projects described above. Furthermore, there have been suggestions that one way to increase the appeal of offshore wind farms is to allow for multiple use management of the wind farm area including other operations such as aquaculture.[171] The potential for multiple use development on the OCS is hampered by the need for multiple regulatory agencies to be involved in permitting. Thus, leaving authority for offshore renewable energy development inside MMS may miss key opportunities to reform ocean governance in America.

The Energy Resource Management Service

The creation of the Energy Resource Management Service (ERMS) would require new enabling legislation to rename and refocus the Minerals Management Service. The OCSLA Amendments modified OCSLA and charged the Secretary of the Interior via the Minerals Management Service to balance offshore energy development with environmental concerns.[172] In fulfilling this task, the Secretary must consider energy and national security needs as well as environmental threat in creating OCS leasing plans. The new Energy Resource Management Service would have an altered mandate that focused on meeting America's energy demand using all available sources. The ERMS would be responsible for all leasing and permitting for all minerals extraction and energy generation within the United States. The primary mission of the ERMS would be to ensure that America's energy needs are met using a balanced portfolio of resources and generating technologies in a regionally balanced manner.

In the aftermath to Hurricane Katrina, Americans became acutely aware of our strong regional dependence on the Gulf of Mexico for energy resource production and the need for regional diversification in energy supply. As part of the initial response, many companies with interests in a stable petroleum supply pushed Congress to reopen oil and gas leasing on other portions of the United States Continental Shelf.[173] The ERMS would be able to ensure that energy resource production is regionally diversified in a manner that is economically feasible and sensitive to the environmental concerns of coastal states. As such, the ERMS would have a strong capability to holistically manage the energy sector in the United States and work to increase energy independence and security of the US energy supply.

While the ERMS is attractive for its ability to ensure balanced energy development, it does have several significant costs. First, the actual economic and political costs of reframing the way that America approaches energy management would be high. This is especially true because the realignment and consolidation of all aspects

[171] Buck *et al*., *supra* note 147.
[172] Biliana Cicin-Sain & Robert W. Knecht, The Future of U.S. Ocean Policy 84 (Island Press 2000).
[173] Letter from the American Gas Association to Dennis Hastert, *supra* note 10.

of energy resource extraction and electricity generation would require the combination of authority from multiple agencies, and is likely to be met with some resistance. Assuming that the Energy Resource Management Service would be created primarily from MMS, resistance to the reform inside of MMS should be low and the ERMS should be able to preserve and take advantage of a high level of MMS expertise in OCS resource management.

The Energy Resource Management Service is a significant step forward in creating a comprehensive approach to meeting America's energy demands. However, the ERMS would be focused solely on energy resource extraction and generation and therefore would be ill-equipped to consider multiple-use management on the OCS. Thus, the ERMS is not a significant improvement over the current regulatory framework when evaluated in terms of its ability to facilitate a more complete and coordinated system of ocean governance.

The Outer Continental Shelf Resource Authority

The Outer Continental Shelf Resource Authority (OCSRA) would be a new executive agency with authority to regulate all uses of the Outer Continental Shelf. The primary purpose of the OCSRA would be to ensure coordinated, sustainable development of the Outer Continental shelf while ensuring that competing uses of ocean space are properly weighed. The OCSRA would be a far-reaching agency that would take over all aspects of ocean management from the federal agencies in which they are currently housed, including MMS and the National Oceanic and Atmospheric Administration (NOAA).

Although the creation of the OCSRA would be highly disruptive to the current system of ocean governance, comprehensive ocean resource management is a goal that is supported by both the United States Commission on Ocean Policy[174] and the Pew Oceans Commission.[175] In their comprehensive evaluations of the state of America's ocean resources, both of these groups highlighted the need for comprehensive ocean resource management on an ecosystem level.[176,177]

The overall cost of creating an agency like the OCSRA will be high because it will involve the realignment and consolidation of major regulatory responsibilities from different government departments. For example, simply combining authority over fisheries, which currently resides in the National Marine Fisheries Service in NOAA, and authority over offshore energy resources requires pulling agencies from two different cabinet departments: NOAA is housed in the Department of Commerce while MMS is part of the Department of the Interior. If one were to go further and place all offshore functions in a single body, it would also require adding the permitting authority of the Army Corps of Engineers. Such a rearrangement of government functions would not only be extremely expensive by also politically difficult. At least one cabinet level

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[174] United States Commission on Ocean Policy, An Ocean Blueprint for the 21st Century 61 (2004), *available at* http://oceancommission.gov (last visited Feb. 27, 2006).

[175] Pew Oceans Commission, America's Living Oceans: Charting a Course for Sea Change 34 (2004), *available at* http://www.pewtrusts.org/ideas/ideas_item.cfm?content_item_id=1635&content_type_id=8&issue_name=Protecting%20ocean%20life&issue=16&page=8&name=Grantee%20Reports (last visited Feb. 27, 2006).

[176] United States Commission on Ocean Policy, *supra* note 174, at 99.

[177] Pew Oceans Commission, *supra* note 175.

agency will have to give up a significant authority over marine resources for this consolidation to occur.

In terms of considering differing energy supplies, the OCSRA will not be able to be as broad in its approach as the ERMS, but has the potential to perform better than MMS. OCSRA would have the primary responsibility of balancing all uses of America's marine resources including non-use functions such as conservation. Ideally, the OCSRA would be composed of a broad group of stakeholders representing all interests and therefore would be able to fully weigh all uses of the OCS. Although energy development would not be the primary function of the OCSRA, OCS energy production is undeniably one of the most important uses of the OCS, and therefore the Outer Continental Shelf Resource Authority would have energy development as one of its core functions. As the OCSRA would also be responsible for other competing uses of the OCS, it would be able to examine which types of energy development are compatible with other OCS uses in a given region.

The OCSRA is clearly the best option for weighing multiple uses of the Outer Continental Shelf. The Outer Continental Shelf Resource Authority would have the ability to facilitate multiple use management schemes. As the final authority weighing all potential uses of the Outer Continental Shelf, a public space, the OCSRA would be the most thorough way to fulfill the government's public trust obligation. As the steward to the Outer Continental Shelf, the government bears the responsibility to manage the Outer Continental Shelf and all of its associated resources for the maximum benefit of the American people. By consolidating the regulation of all competing uses of the OCS into one body, the OCSRA would be able to fully consider how different uses of ocean space benefit the public as a whole.

Recommendations for the Minerals Management Service

While the OCSRA may be the best way to manage the public trust resource of the Outer Continental Shelf, the high costs and potential political resistance make this option infeasible. This makes the ERMS the most desirable solution, and MMS could easily move in this direction considering OCS energy development in a comprehensive way. Given that the overall administrative structure has already been determined with the assignment of authority for OCS energy regulation to MMS via the secretary of the Interior, the following is a set of substantive recommendations for MMS it proceeds with the development of a regulatory system for offshore renewable energy.

Focus on fulfillment of the Public Trust obligation: It is imperative that MMS first meet its legal obligation to act as a guardian of the public trust of the Outer Continental Shelf. The placement of offshore renewable energy resources under OCSLA obligates the Secretary of the Interior to create a competitive system for the granting of leases for offshore wind energy. In Texas, the state has pursued negotiated leases with individual developers because of a lack of broad interest in offshore wind energy development. Prior to the passage of the Energy Policy Act, there was a rush of developers attempting to get wind farm proposals approved before leasing was required.[178] This suggests that there is sufficient interest to support a competitive leasing system for offshore wind energy development. However, MMS must carefully consider the details of a

[178] *supra* note 94.

competitive system so that it can be sensitive to the differing needs and scales of different types of renewable energy development.

Work to build public support for offshore renewable energy: As the Cape Wind case demonstrates, public acceptance will be crucial to the future success of offshore renewable energy development in the United States. Public support may be particularly difficult to gain in regions of the country that have not experienced offshore oil and gas development and therefore are not accustomed to seeing offshore industrial structures. Therefore, public education about the benefits of offshore renewable energy will be crucial to the success of future developments. Public acceptance is especially important because public resistance to a project may make a state less likely to permit the necessary on-shore support structures.

Improve coordination with coastal states: Under the current regulatory system, the only opportunity for the state to have input regarding energy development in federal waters is to comment on whether proposed leasing, exploration, and development plans are consistent with the state's Coastal Zone Management Plan.[179] This commenting authority is weak at best, and it will not be sufficient for renewable energy development, which requires substantial state cooperation in the permitting of support structures. Improved coordination with states is imperative because it will be a waste of MMS's resources to explore the possibility of offshore renewable energy development in areas where the adjacent coastal state will not agree to permit the necessary supporting structures. However, MMS must also keep in mind the need to add regional diversity in offshore energy development and work with coastal states to find acceptable means of developing OCS renewable energy resources across the country.

Develop a system of revenue sharing: Currently, the Outer Continental Shelf Lands Act contains provisions that allow for the sharing of revenue with the adjacent coastal state for oil and gas extraction.[180] These revenues are intended to help the state mitigate any potential negative impacts of offshore oil and gas extraction. One means of countering public resistance to offshore renewable energy projects may be to create a revenue sharing system that compensates the public for view shed disruptions. In the state of Texas, all revenues from leasing activities in state waters are deposited in the public school fund.[181] This helps to create support for all offshore energy development activities because the revenues from these activities directly improve services for the people of Texas.

Develop a zoning system with priority areas: All of the European countries examined in this comment use a system of priority zoning that identifies specific areas for expedited wind energy development. The zoning approach has two important advantages: It allows for early public comment and environmental review on a larger scale. MMS should examine the potential offshore renewable energy resources along the OCS and also examine other uses of these areas and then propose a network of renewable energy

[179] 43 U.S.C. §1351 (2000).
[180] *See, e.g.* 43 U.S.C. §1336(g)(1).
[181] *supra* note 77.

development zones for specific types of renewable energy. The process of creating renewable energy zones will allow for early public participation in the decision-making process and may also expedite development of renewable energy projects, as less review and comment is likely to be necessary for proposed projects within a renewable energy zone.

Develop a system to support independent research and environmental evaluation: MMS should develop a system similar to COWIRE in the UK where bonus bids for offshore renewable energy development are deposited into an account that is then used to fund independent research into the potential effects of offshore renewable energy development. Offshore renewable energy development is expanding rapidly, and many of its impacts are not known with certainty. Therefore, the funding of such research will be essential to understand the true costs of offshore renewable energy development and allay public fears over environmental impacts.

Use a phased-in approach to offshore renewable energy development: Both the UK and Denmark have been successful with demonstration projects to develop technical capability in offshore wind energy development. The US should pursue a similar system of small-scale projects. The use of demonstration projects will allow MMS to evaluate the potential impacts of offshore renewable energy installations without committing to large projects with potentially significant impacts. Furthermore, the use of demonstration projects may help to build public support for offshore renewable energy development in the United States.